1. In a wide field of view, limited rotation scanning microscope for examination of a surface of an object,

a scanning assembly comprising an oscillating rotary support structure associated with a driver and constructed to travel in periodic motion over the object to be viewed in a predetermined arcuate scan path over a scan range of at least 1 mm,

a micro objective lens mounted on the rotary oscillating support structure,

the micro objective lens characterized in having weight of less than about 2 grams, the lens mounted on the support structure with its axis normal to the surface of the object for essentially on-axis scanning throughout the arcuate scan range,

and the driver for the support structure adapted to oscillate the support structure to cause on-axis scanning of the object.

2. The assembly of claim 1 including a reflecting system mounted on the rotary support structure to define a light path communicating with the micro lens along the axis of the lens, the reflecting system constructed to maintain this optical path in optical communication with a stationary optical system over a light path of fixed length throughout the range of travel of the rotary oscillating support structure.

3. The assembly of Claim 1 in which the micro lens is an aspheric lens.

4. The assembly of claims in which the micro objective lens forms the entire objective of the microscope.

5. The assembly of claim 1 in which the micro objective lens cooperates with stationary optical elements to form the objective of the microscope.

6. The assembly of Claim 1 in which the oscillating assembly has a moment of inertia less than 50 gm-cm$^2$, preferably of the order of 25 gm-cm$^2$.

7. The assembly of claim 1 in which stationary optics produces at least two beams of different wave lengths and a merging system is constructed to merge the beams into a single illuminating beam directed to the micro objective lens.

8. The assembly of claim 7 in which the micro objective lens has characteristic chromatic aberration, and at least one device is included in the path of at least one of the beams to cause rays of one wave length to focus at a point different from the point of focus of rays of another wave length, the different focusing characteristics of the rays being predetermined in relation to the chromatic aberration characteristic of the objective lens to enable focus of the respective wave lengths, by the objective lens, upon the same point on the object.

9. A wide field of view limited rotation scanning microscope system comprising the assembly of claim 1 combined with a translation system for producing relative linear movement over a translation range of an object to be scanned relative to the rotary support structure, the direction of translation being substantially normal to the center region of the limited rotation scan path.

10. The microscope system of claim 9 constructed and arranged to record an image area of at least one square centimeter of the surface being examined, the numerical aperture of the lens, its field of view, the scan range and the translation range being cooperatively selected to produce, for a given wave length, at least one million picture elements per $cm^2$ of area scanned

11. The wide field of view scanning microscope of claim 9 constructed to produce images in a transmission or reflection mode, the numerical aperture of the micro objective lens being at least about 0.5.

12. The wide field of view scanning microscope of claim 11 in which the field of view of the micro objective lens is less than about 25 microns.

13. The wide field of view scanning microscope of claim 11 in which the field of view of the micro objective lens is less than about 10 microns.

14. The wide field of view scanning microscope of claim 9 constructed to detect fluorescence stimulated by a spot of light passing through the micro objective lens, in which the numerical aperture of the scanning objective lens is greater than 0.6.

15. The wide field of view microscope of claim 14 in which the field of view of the micro objective lens is less than about 25 microns.

16. The microscope system of claim 9 constructed as a transmission microscope, the stationary optics including at least one stationary light source arranged to launch light to said micro objective lens to illuminate a spot on the object being viewed, and a

detector system disposed on the opposite side of the object being viewed.

17. The microscope system of claim 9 constructed as a reflectance microscope, the stationary optics including at least one stationary light source arranged to launch light to said micro objective lens to illuminate a spot on the object being viewed, and a detector system arranged to receive, via the micro objective lens, light reflected from the region being illuminated by the objective lens.

18. The microscope system of claim 9 constructed to perform as a fluorescence reader, the stationary optics including at least one stationary light source arranged to launch light to said rotating micro objective lens to illuminate a spot on the object being read with a wave length predetermined to excite a fluorophor possibly present in the object, and a detector arranged to receive, via the micro objective lens, fluorescing light from the fluorophor at a different wavelength emitted from the region being illuminated by the micro objective lens.

19. The microscope system of claim 9 or 18 constructed to image detected light upon a pin hole preceding a detector to serve as a confocal microscope.

20. The microscope system of claim 18 in which the objective lens has a numerical aperture greater than 0.6.

21. The microscope of claim 18 constructed and arranged so that the micro objective lens projects, on to the object, an illuminating spot between about 1 to 50

microns in diameter, the micro objective lens having a numerical aperture of about 0.6 or more for collection of relatively low intensity fluorescing radiation.

22. The scanning microscope of claim 9 in which the axis of rotation of the rotary support structure is stationary and the translation system for producing said relative linear movement comprises a linear stage constructed to move the object to be viewed under the oscillating rotary structure.

23. The scanning microscope of claim 9 in which stationary optics include a reflector disposed on the axis of rotation of the rotary structure, and a reflector on the rotary structure is disposed on said axis of rotation, the two said reflectors arranged in an optical path between said stationary optics and said scanning objective lens throughout the range of rotation of said oscillating rotary structure.

24. The apparatus of claim 23 in which said stationary optics includes a detector to detect light collected by said rotating micro objective lens from the object being scanned.

25. The apparatus of claim 23 or 24 in which said stationary optics includes at least one stationary light source arranged to launch light to said objective lens to illuminate a spot on the object being viewed.

26. The scanning microscope of claim 1 in which stationary optics include a path deflecting device arranged to vary the portion of the micro objective lens lying in the optical path.

27. The scanning microscope system of claim 9 in which stationary optics includes a path-deflecting device arranged to vary the portion of the micro objective lens lying in the optical path in the manner to adjust the relationship of successive scan paths upon the object being scanned.

28. The apparatus of claim 27, in which the object is scanned during both clockwise and counterclockwise rotation of the oscillating rotary support structure and said adjustment is in the sense of making more uniform, along the length of the scan path, the spacing between the mid lines of the successive scan paths.

29. The microscope system of claim 26, 27 or 28 in which the path-varying device is a dithered reflector driven in synchronism with the rotary oscillating support structure.

30. The apparatus of claim 29 in which the dithered reflector is a mirror.

31. The apparatus of claim 26, 27 or 28 in which the path-deflecting device is an acousto-optical deflector driven in synchronism with the rotary oscillating support structure.

32. The apparatus of claim 26, 27 or 28 in which the path-deflecting device is an electro-optical deflector driven in synchronism with the rotary oscillating support structure.

33. The wide field of view scanning microscope of claim 9 including a position detector for detecting the

position of the oscillating assembly, and including a data collection system that collects data at selected positions determined by said position detector.

34. The apparatus of claim 33 including a control system for said driver which includes a servo control loop that includes said position detector.

35. The apparatus of claim 33 or 34 in which the position detector is associated directly with the oscillating support structure to determine its position directly.

36. The apparatus of claim 35 in which said driver is an electric motor controlled by a servo control loop controlled by the directly determined position of the oscillating rotary support structure.

37. The wide field of view scanning microscope of claim 1 or 9 wherein the radial distance of the micro objective lens from the center of rotation of the support structure is more than 1 cm, and the moment of inertia of the rotary structure, excluding the armature of the driver, is less than about 50 gm-cm$^2$, preferably of the order of 25 gm-cm$^2$.

38. The microscope of claim 37 in which the frequency of oscillation of the rotary oscillating structure produces in excess of about 10 scan line acquisitions per second.

39. The apparatus of claim 37 wherein said radial distance is about 2.5 cm or greater.

40. The scanning microscope of claim 9 for transmission or reflection microscopy in which the driver for the rotary oscillating structure oscillates at a frequency of the order of 50 Hz or higher.

41. The wide field of view scanning microscope of claim 1 or 7 in which a data collection control system times the data collection during the scan motion to align data collection points with rows of a predetermined rectilinear raster grid.

42. The scanning microscope of claim 41 in which the data system converts the data to the raster grid by averaging for each point on the grid, the value of each of two data points in the raster row on either side of the grid point, the values weighted by their respective distances from the grid point in question.

43. A limited rotation scanning microscope for examination of an object comprising:

an aspheric micro objective lens having a field of view less than about 20 microns and a numerical aperture greater than about 0.5;

a lens-carrying arm mounted and driven to rotate in an arc, in oscillating motion, about an axis that lies normal to the general plane of the object to be examined,

the micro objective lens being mounted on the arm at a position spaced from the axis of rotation of the arm so that the micro objective lens is swept in an arc by rotation of the arm, the axis of the micro objective lens being normal to the plane of the surface to be examined,

the axis of rotation being stationary, and

a translating mechanism arranged to translate the surface to be examined under the rotating micro objective lens,

a light source mounted on a stationary support and associated with optical elements defining an optical path for light to pass from the light source to the micro objective lens, thence to a spot on the surface to be examined.

44. The scanning microscope of claim 43 in which the aspheric micro objective lens forms the entire objective of the microscope.

45. The scanning microscope of claim 43 including stationary optical elements that cooperating with the aspheric micro objective lens mounted on the oscillating arm.

46. The scanning microscope of claim 43 including a light source mounted on a stationary support and associated with optical elements defining an optical path for light to pass from the light source to the micro objective lens, thence to a spot on the surface to be examined.

47. The scanning microscope of claim 46 in the form of a transmission microscope in which light from a spot passed through the micro objective lens and object reaches a detector.

48. The scanning microscope of claim 46 in which light from a spot of light passed through the micro objective lens and to the object, returns through the micro objective lens to a detector.

49. The scanning microscope of claim 48 constructed to read fluorescing light from the object.

50. The scanning microscope of claim 43 including a control system for producing coordinated rotation and translation of the object, the microscope constructed to receive data from scan paths generated during clockwise and counterclockwise rotation of the arm, the control system including a compensatory system that varies the relationship between movement of the micro objective lens and translation of the object in a manner tending to make substantially uniform the distance between the mid-lines of the successive scan paths.

51. The scanning microscope of claim 50 in which said compensatory system varies the position on the objective lens of the light path communicating with the stationary light source.

52. The scanning microscope of claim 51 in which said compensating system comprised a dither mirror.

53. The scanning microscope of claim 9 or 43 in which a table receives the object, the table being associated with three adjustable elevators to raise, lower and tilt the table for focusing, and a control system constructed to conduct a prescan of the object in which data concerning orientation is stored, and a control system responsive to the stored data is effective to actuate the elevators as scanning proceeds to maintain the object in focus.

54. A dither mirror construction comprising a mirror mounted on a flexure and a piezo crystal associated with the mirror in the manner to cause deflection of the mirror on its flexure.

55. The dither mirror of claim 54 employed in the respective scanning microscope of claims 26, 27 or 52.

56. A method of scanning an object comprising moving in scanning motion a lens of mass less than about 2 gm on a moving structure, directly detecting the position of the lens while collecting light from the object with the lens, and compiling detected data based on positions directly detected at the time of taking the data.

57. A method of scanning an object employing rotating a lens on an arm in scanning arcs over an object that is translating relative to the axis,

including deflecting the optical path relative to the lens in a compensatory motion in the sense tending to make substantially uniform the spacing between adjacent scan lines upon an advancing object.

58. A scanning microscope comprising

a micro objective lens mounted to move in scanning motion over an object,

stationary optics that produces at least two beams of different wave lengths and a merging system constructed to merge the beams into a single illuminating beam directed to the micro objective lens,

the micro objective lens having characteristic chromatic aberration, and a device is included in the path of at least one of the beams to cause rays of one wave length to focus at a point different from the point of focus of another wavelength, the different focusing characteristics of the wavelengths being predetermined in relation to the chromatic characteristic of the micro objective lens to enable focus of the respective wave lengths, by the micro objective lens, upon the object.

59. The scanning microscope of claim 58 including stationary optical elements that cooperate with the micro objective lens mounted on the oscillating arm to form an objective lens of the system .

60. A rotary scanning system producing arcuate scan motion having a data collection control arranged to time the data collection during the arcuate scan motion to align data collection points with rows of a predetermined raster grid to which the data is to be converted.

61. The scanning system of claim 60 including a data conversion system arranged to convert data to the raster grid by averaging for each raster point the value of each of the two data points in the row on either side of the raster point, the values weighted by their respective distances from the raster point in question.